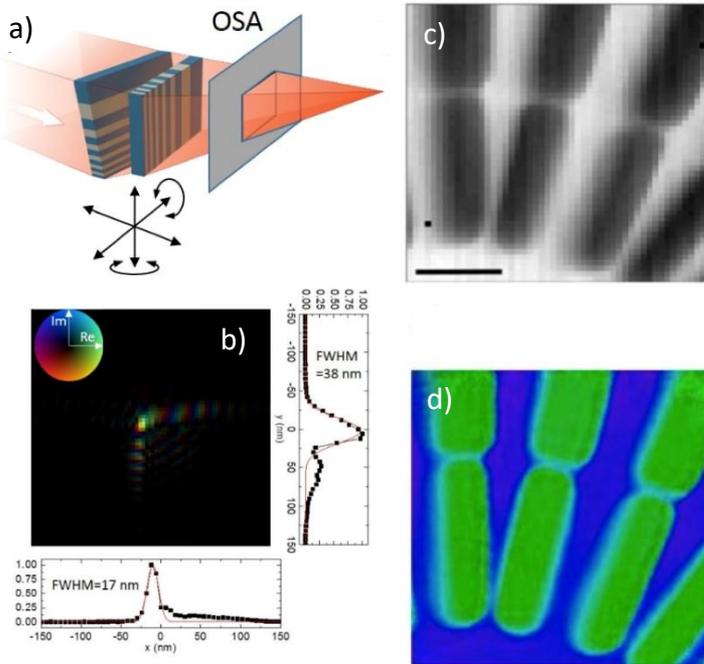


Sub-20 nm X-Ray Imaging with Bonded Multilayer Laue Lenses



(a) schematic view of the cross-bonded MLLs. (b) A $17 \times 38 \text{ nm}^2$ point focus was obtained at the common focal plane. (c) STXM image and (d) ptychography reconstruction of the star test pattern. The scale bar is 250 nm.

X. Huang, W. Xu, E. Nazaretski, N. Bouet, J. Zhou, Y. Chu, H. Yan, *Optics Express*, **2017**, 25(8), 8698-8704.

Work was performed at Brookhaven National Laboratory

Scientific Achievement

A common focal plane was achieved from a pair of bonded multilayer Laue lenses (MLLs) at 9.3 keV and used for scanning probe X-ray imaging.

Significance and Impact

A bonded MLL pair significantly simplifies the optical setup and alignment complexity, thus greatly extending its applications in both scanning and full-field X-ray microscopies.

Research Details

- High quality MLLs with $53 \mu\text{m}$ and $43 \mu\text{m}$ apertures and 4 nm outmost zone width were used for bonding.
- Ultrahigh orthogonal accuracy down to 0.03 degree was achieved with a developed optical alignment system.
- A $17 \times 38 \text{ nm}^2$ point focus was obtained from the bonded MLL pair, which was used at NSLS-II Beamline 3-ID (HXN) to generate a scanning transmission X-ray microscopy (STXM) image with $50 \times 50 \text{ nm}^2$ spatial resolution.
- The image resolution was further enhanced to $13 \times 13 \text{ nm}^2$ by applying ptychography reconstruction.

